

FEDERAL AID IN SPORT FISH RESTORATION

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Juneau Recreational Fisheries
Enhancement

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F-26-R

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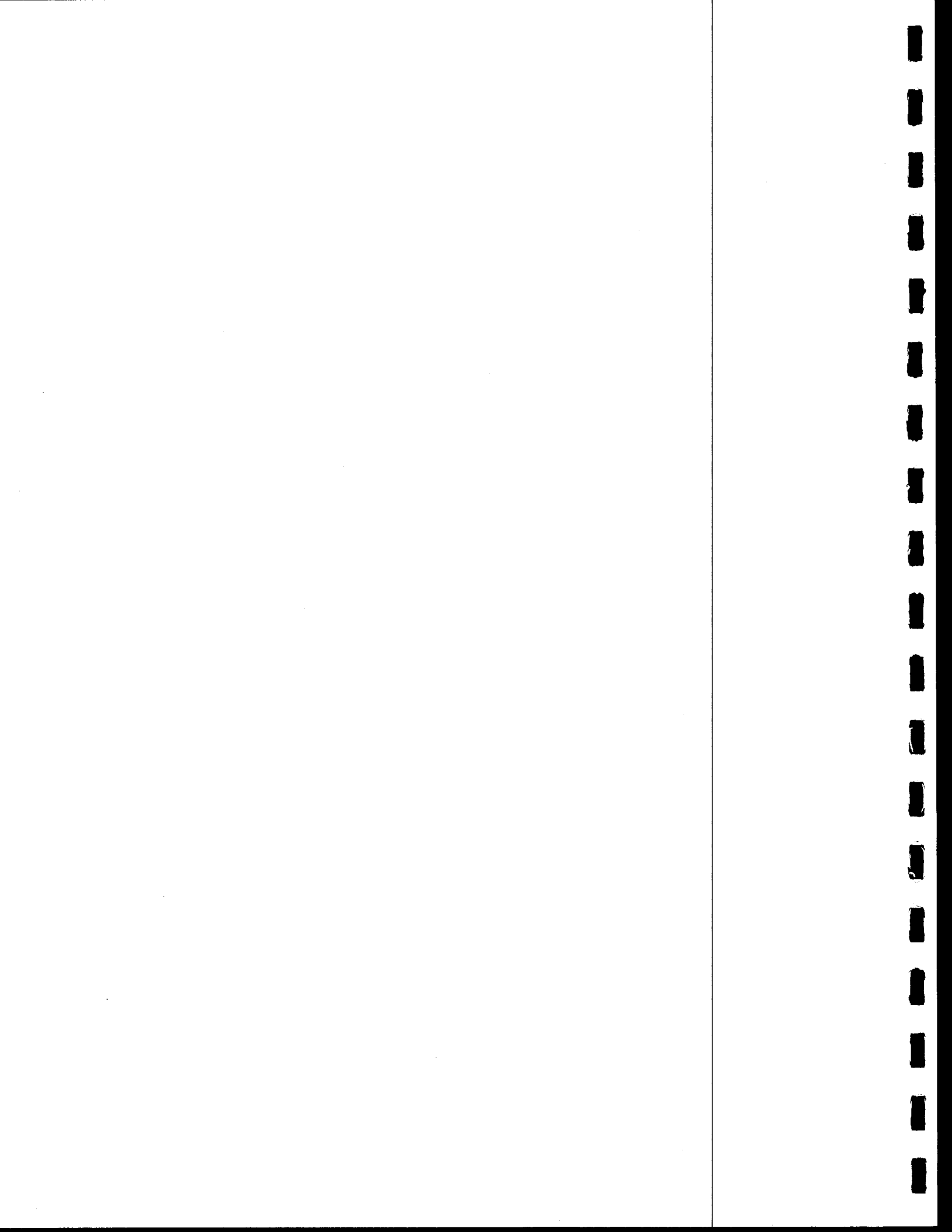


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RESEARCH PROJECT SEGMENT

State: Alaska

Name: Southeast Sport Fisheries
Enhancement

Project: F-26-R-1

Study: D-1

Study Title: Juneau Recreational
Fisheries Enhancement

Cooperator: Ron Josephson

Period Covered: 1 October 1986 to 30 June 1987

ABSTRACT

This project is designed to enhance sport fishing opportunities in the Juneau area using a number of different means. In 1987 seven groups of chinook salmon, *Oncorhynchus tshawytscha*, smolts; four groups of coho salmon, *O. kisutch*, smolts; one group of steelhead trout, *Salmo gairdneri*, smolts; and one group of 3-year-old coho salmon from Snettisham Hatchery were released in the Juneau area. Smolts were released at six different sites and under three different imprinting strategies. Similar groups were released at Snettisham Hatchery. All groups of smolts were coded-wire tagged for future evaluation of survival and contribution to commercial and sport fisheries. The 3-year-old coho salmon were released into Twin Lakes to provide a landlocked freshwater fishery. In an effort to produce an earlier run of coho salmon in the Juneau area, two different stocks of coho salmon were released from Snettisham Hatchery for future evaluation of run timing and contribution to the sport fishery. A steelhead trout spawning operation took place in Juneau for the purpose of producing fish for plants in Montana Creek.

KEY WORDS: chinook salmon, *Oncorhynchus tshawytscha*, coho salmon, *O. kisutch*, steelhead trout, *Salmo gairdneri*, enhancement, coded-wire tag, sport fishing.

INTRODUCTION

There is a need to enhance the recreational fishing opportunities in the Juneau area (Figures 1 and 2). The local population has expressed a strong interest in sport fishing, as demonstrated by an increase in effort; however, area streams support only small runs of coho salmon, *Oncorhynchus kisutch*, and steelhead trout, *Salmo gairdneri*; there are no chinook salmon, *O. tshawytscha*, streams. It is unlikely that the production capacity of these streams can support the fishing pressure of the local population. Although the state hatchery system has projects in southeast Alaska that are specifically aimed at the sport fishing public, there is a need to target on sport fisheries that are available to most anglers. These fisheries need to be in areas near major population centers and accessible to shore-based fishermen. Juneau recreational anglers have indicated a desire for this type of fishery as well as for increased availability of coho salmon during July and August. The most effective way of meeting these desires is through the use of enhancement techniques: specifically planting fish in locations with good fishing access and harvest potential. This project proposes to provide three highly desirable salmonids (chinook salmon, coho salmon, and steelhead trout) directly to the Juneau-area sport fishermen.

OBJECTIVES

1. Through 1987 releases, provide additional harvest of 1,550 adult chinook salmon and 500 adult coho salmon for the Juneau marine sport fishery during 1988-1992.
2. Through 1987 releases, provide an additional harvest of 378 adult chinook salmon and 2,000 adult coho salmon for terminal freshwater sport fisheries during 1988-1992.

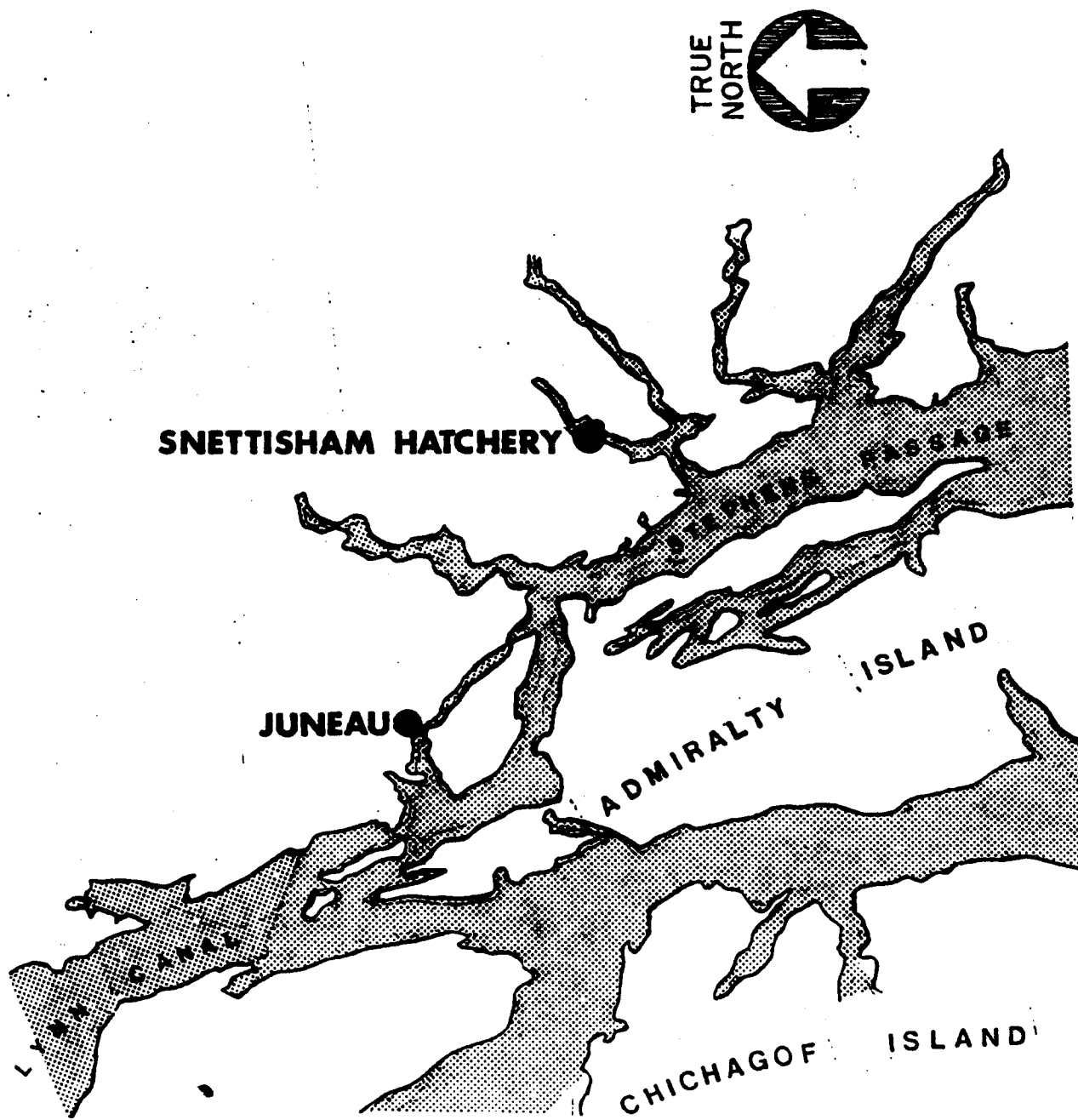


Figure 1. Project location.

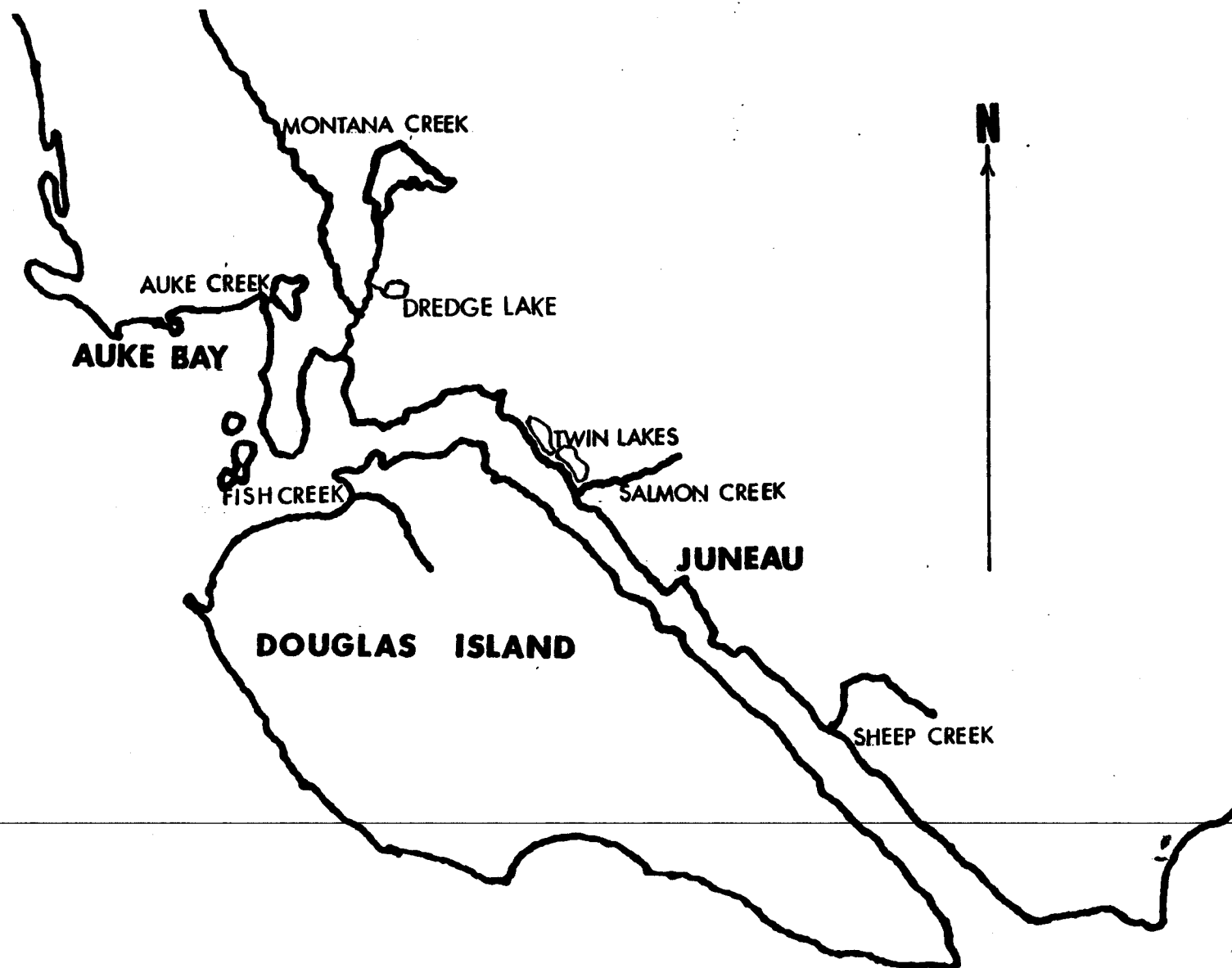


Figure 2. Location of Juneau release sites.

3. Determine chinook salmon production from four release sites and selected imprinting strategies at two of these sites.
4. Determine coho salmon production from four release sites.
5. Complete rearing of 10,000 coho salmon (1984 brood) and release them into Twin Lakes.
6. Retain 10,000 coho salmon (1985 brood) for 1 year of additional rearing at Snettisham prior to release into Twin Lakes in 1988.
7. Produce 130,000 coho salmon smolts by 30 June 1987 for release at Snettisham Hatchery (85,000 from Montana Creek stock and 55,000 from King Salmon River stock).
8. Collect a minimum of 150,000 coho salmon eggs from both 1986 King Salmon River and Montana Creek stocks for performance testing at Snettisham Hatchery.
9. Produce a minimum of 200,000 coho salmon fingerlings by 30 June 1987 from the 1986 spawning operations at King Salmon River and Montana Creek.
10. Complete rearing, marking, and releasing of 2,400 steelhead trout smolts into Montana Creek.
11. Collect 30,000 Peterson Creek stock steelhead trout eggs for incubation and rearing at Snettisham Hatchery.

METHODS

Chinook and Coho Salmon Smolt Planting

This portion of the project is intended to enhance the Juneau-area sport fisheries in fresh water and salt water and to identify production techniques that best meet project objectives of providing fish for harvest in targeted areas and time periods. Smolts are produced at Snettisham Hatchery for release in the Juneau area.

Production at Snettisham Hatchery

Chinook and coho salmon smolts for this project were the result of spawning operations in 1985. The chinook salmon were collected as eggs at Crystal Lake Hatchery and transported to Snettisham for incubation and rearing. The coho salmon were from the adult return to the Snettisham Hatchery. The smolts were produced using standard hatchery techniques; rearing occurred in raceways (110 cubic meters) that were supplied with process water at an exchange rate of 4/hour. Temperatures were collected daily (noon) with a calibrated thermometer. The fish were fed a diet of Alaska Dry Pellet (ADP) at a rate varying with temperature and cultural practices.

Tagging

For this project, seven groups of approximately 30,000 chinook salmon each and three groups of approximately 20,000 coho salmon each were marked by excision of the adipose fin and insertion of a coded-wire tag (CWT). A unique tag code was used for each group of fish. Based on our return and contribution expectations, Hal Geiger (Fisheries Rehabilitation, Enhancement and Development (FRED) Division Biometrician, Juneau) has calculated that releases of 30,000 tagged chinook salmon and 20,000 coho

salmon from each group should allow for a 95% chance of detecting a 50% difference in survival between groups. Additional marking of production groups of coho and chinook salmon also took place so that comparison of survivals and fishery contribution rates could take place in the future. Marking occurred during February to May.

After tagging, the salmon were placed into raceways that were divided in half by screens. In some cases the tag groups were only a portion of the scheduled release; additional fish were then counted into the raceway to achieve the desired number of fish.

Transport

We transported smolts to Juneau using a variety of methods; the primary one entailed the use of fiberglass tanks (1.9 m³). The tanks were equipped with carborundum diffusers for the introduction of oxygen, which was supplied at the rate of 2.5 liters/min. In addition, the tanks were equipped with mechanical aerators. An antifoam compound was used after earlier transport mortalities were attributed to high carbon-dioxide levels (see Piper et al. 1983). Salt (NaCl) was added to the transport water at a concentration of 1% to bring the salt concentration of the water to a level approximately that of the fish. The transport tanks were loaded in the hold of a landing craft for transport to Juneau. In most cases the landing craft was able to get to the release site; alternatively, the tanks were transferred to a flatbed truck for transport to the release site. Transport time varied from 6 to 12 hours. Smolts were also transported in 121-liter plastic containers (32-gallon garbage cans) that typically held 96 liters of fish and water. Salt was added at 1% and oxygen was supplied. The plastic containers of fish were transported in a DeHaviland Beaver aircraft. Transport time was approximately 1 hour; flight altitudes were kept below 1,000 feet to guard against gas-bubble disease.

Imprinting and Release

Releases took place at a number of different locations; different imprinting strategies were employed at each site. The strategies were based on the fact that juvenile salmon that are transported to a new stream at the appropriate life stage will imprint and return to that stream.

Each release site in this study required a slightly different rearing and release strategy because of its special characteristics. However, when possible, all releases of a species occurred at the same date and time to make comparisons more valid. Short-term reared fish were fed ADP twice a day to satiation.

Auke Creek:

The Auke Creek releases were conducted cooperatively by the National Marine Fisheries Service (NMFS) and the Alaska Department of Fish and Game (ADF&G). There were three distinct groups of chinook salmon released at this site. Two groups of juveniles were held in floating net pens for 2 weeks before release, while the third group was released directly into the creek. Each pen (30 m in circumference and 4.5 m deep [322 m³]) was loaded with 31,500 fish. The one freshwater pen had a plastic barrier on the uppermost 1.5 m of the netting and was supplied with fresh water via a pipeline from Auke Creek. The seawater pen was located in Auke Bay, near Auke Creek, and did not receive a direct supply of water. Imprinting water was passively transported by Auke Creek to the seawater pen. The chinook salmon were all released on the same night.

Fish Creek:

There were two groups of approximately 31,000 chinook salmon smolts each released at Fish Creek. The chinook salmon juveniles

in one group were held in a net pen similar to those used at Auke Creek. The net pen was placed in a gravel pit pond (3 hectares, maximal 12-m depth) along the north side of Fish Creek in mid-May. These chinook salmon were fed from a skiff on a daily basis. The second group of chinook salmon was released directly into the pond and allowed to emigrate volitionally. The direct release took place at the same time that the first group was placed in the net pens. The net-pen group was released at the same time that other Juneau chinook salmon were released.

A group of approximately 50,000 coho salmon smolts was transported to Fish Creek and held in the same net pen that previously held the chinook salmon. These fish were held for a period of 3 weeks to allow for growth and imprinting and then released.

Montana Creek:

One group of chinook salmon smolts was released into upper Montana Creek. These fish were transported by truck as far up the Montana Creek road as conditions allowed and released directly into a pool in the creek so that they would be able to emigrate volitionally.

Salmon Creek:

Approximately 100,000 coho salmon smolts were transported to Salmon Creek over a 2-week period. The release of these fish was spread out because holding space was limited at this site. These fish were held for imprinting purposes in portable rearing containers supplied with Salmon Creek water for at least 48 hours. Following imprinting, the coho salmon smolts were released directly into Salmon Creek and allowed to emigrate volitionally.

Sheep Creek:

One group of approximately 30,000 chinook salmon smolts was transported to Sheep Creek in mid-May. These fish were held in a net pen located near the Sheep Creek tidal delta. The pen (11 by 11 by 3 m) was fitted with a barrier on the uppermost 0.5 m to retain fresh water. A pipeline from Sheep Creek was used to supply the imprinting water. The smolts were released after 2 weeks of imprinting; the release time coincides with that of other Juneau chinook salmon releases. Through a cooperative agreement with ADF&G, Douglas Island Pink and Chum, Incorporated managed the rearing and net-pen phases.

Dredge Lake:

One group of approximately 100,000 coho salmon were transported to Dredge Lake in early June for direct release. Fish were transported directly to the lake by helicopter and released for volitional emigration. This release is part of a cooperative agreement with the U. S. Forest Service (USFS).

Twin Lakes:

Two connected landlocked lakes in Juneau called Twin Lakes were stocked to produce a freshwater sport fishery. Snettisham Hatchery has stocked age-2.0 (3-year-old) coho salmon in this system in two previous years. The fish planted this year were from the 1984 brood at the facility. They were retained as smolts in June 1986 for an additional year of rearing. At the hatchery, the fish were reared in a silo-type rearing container and fed a diet of ADP daily. The release into Twin Lakes took place in mid-June.

To provide fish for future stocking, approximately 16,000 additional coho salmon (1984 brood) are being reared at Snettisham; a portion of these fish are triploids. The triploid fish

are being produced to investigate the possibilities of reducing losses due to natural maturation. It is hoped that triploids will live longer and grow larger.

Early Stock Coho Salmon

Two coho salmon stocks (Montana Creek and King Salmon River) collected as eggs in 1985 were reared and released in 1987. The performance of these fish will be compared to the performance of the hatchery stock, in a search for a stock of fish that will contribute to the Juneau sport fishery in July and August. The two stocks of fish were each reared in individual raceways until mid-February when they were coded-wire tagged. Approximately 30,000 fish from each group were tagged with a distinct code. The two groups were then combined for continued rearing at Snettisham.

Adult collection efforts at both King Salmon River and Montana Creek took place in 1986. An electro-shocker and gill net were used to collect fish at both sites; moreover, a weir was also used at King Salmon River. The fish collected were held in 1- x 1- x 2.5-m wire-mesh pens secured in protected locations. Brood-stock removal schedules were used to determine the number of fish that could be taken (Appendix Tables 1 and 2). Repeated surveys were conducted at Montana Creek by ADF&G Sport Fish Division to ensure that an accurate count was available. At King Salmon River, a foot survey of the system was conducted during the predicted peak of spawning.

Steelhead Trout

In late May, approximately 2,400 (Peterson Creek stock) steelhead trout smolts were transported to Juneau from Snettisham Hatchery via a Bell 212 helicopter. The smolts were released directly into a pool in the creek as far up Montana Creek as conditions

allowed. During the transport, standard precautions were taken to minimize stress.

For the fourth year, steelhead trout eggs were taken at Peterson Creek, near Juneau. Fish were collected with the use of an electro shocker, a gill net, and dip nets. "Ripe" fish were live-spawned and returned to the creek. The gametes were collected in dry containers, which were placed in a foam-lined cooler. They were then transported to Snettisham for fertilization and incubation. Pathology samples were not collected because a sufficient disease-screening history exists for this stock of steelhead trout.

Evaluation in the Fisheries

Coho salmon are expected to return to Salmon Creek as adults in the fall of 1987. The contribution of adult salmon to the fisheries will be determined through recovery of coded-wire-tagged fish. Recoveries in the commercial fisheries will be made by the existing port-sampling program. Recoveries in the marine sport fishery will be made by the existing harvest-survey program. Sport fishery harvest surveys will be conducted to determine the contributions to new chinook salmon sport fisheries at the mouths of Auke Creek and Sheep Creek and in both Fish Creek and Montana Creek. Surveys will be conducted to determine the contributions to the coho salmon sport fishery at Salmon Creek and Twin Lakes.

Evaluation of Chinook Salmon Homing and Straying

Only small numbers of chinook salmon are expected from this project in 1987; however, the methodology to be employed in the future has been devised. The incidence of homing and straying of each release group will be examined by recovery of chinook salmon in several streams in the Juneau area. A salmon will be considered to have homed if it is recovered at the freshwater

release site and strayed if it is recovered elsewhere. Saltwater recoveries will not be categorized as "homed" or "strayed", unless they are recovered directly in front of a stream.

The principal recovery streams will be at the release sites: Auke, Sheep, Fish, and Montana Creeks. Recoveries at Auke Creek will receive the most intensive examination, because the ability to count fish at the weir allows complete control of immigrant adults. At Auke Creek, all chinook salmon captured at the weir will be killed. Chinook salmon will not be allowed to pass upstream into the Auke Creek system. Fish and Montana Creeks will be surveyed periodically for live fish and carcasses during the spawning run; CWT information will be collected from chinook salmon in the latter two systems after spawning has occurred.

Other streams in the Juneau area will be surveyed for chinook salmon during the spawning run. These systems include streams in the Mendenhall River drainage: Duck, Jordan, Switzer, Lemon, Salmon, Peterson (25 mile), Peterson (Outer Point), and Wadleigh Creeks. Hatcheries at Kowee and Sheep Creeks and at Port Snettisham operate fish weirs, and as such, staff will be able to report any occurrence of salmon from this study. All adipose-clipped chinook salmon recovered during the study will be measured and examined for CWTs.

RESULTS

Chinook and Coho Salmon Smolt Planting

Snettisham Hatchery chinook and coho salmon were planted in the selected sites from 15 May to 27 June. We were able to achieve the total release objectives at all sites.

Production at Snettisham Hatchery

While sufficient numbers of smolts were available at Snettisham Hatchery to provide for this project's needs, the smolts were smaller than desired. At this facility we would like to produce 12-g smolts; in the past we have been able to accomplish this only when water temperatures have permitted. The smolts produced for release in 1987 were 9 g for chinook salmon and 4 to 8 g for coho salmon. At the release sites where we reared fish for a short time, there was additional growth; chinook salmon reached 10 to 11 g, and coho salmon were 8 g.

Concerns for slow growth are being addressed at Snettisham Hatchery. New feeders allow more frequent automatic feeding over the entire raceway for a longer period of time than the old feeders. We have also installed facilities to accelerate the embryonic development of both chinook and coho salmon with heated water. This provides for 4 to 8 weeks of additional rearing time.

Tagging

All tagging for this portion of the project was conducted at Snettisham Hatchery during 1987. The chinook salmon were tagged from 8 February to 29 April. There were 220,654 fish tagged for Juneau stocking and 102,354 fish tagged for release at Snettisham Hatchery. Table 1 outlines the tagging results.

The coho salmon were tagged from 17 to 29 March and 24 to 25 June. There were 62,717 fish tagged for Juneau stocking and 42,079 tagged for release at Snettisham. Table 2 outlines the tagging results.

Table 1. Summary of chinook salmon tagging at Snettisham Hatchery, 1987 (D-J projects only).

Brood year	Tag code	Number tagged	Tagging dates	Release site
1985	4-22-26	39,260	3/13-3/15	Snettisham
1985	4-27-42	31,697	2/8-2/10	Fish Creek
1985	4-27-43	31,414	2/10-2/11	Auke Creek
1985	4-27-44	31,718	3/6-3/8	Fish Creek
1985	4-27-45	31,272	3/8-3/10	Montana Crk
1985	4-27-46	31,587	2/22-2/23	Auke Creek
1985	4-27-47	31,609	2/24-2/25	Snettisham
1985	4-27-48	31,518	2/25-3/6	Sheep Creek
1985	4-27-49	31,485	3/15-3/17	Snettisham
1985	4-27-50	31,448	4/27-4/29	Auke Creek

Table 2. Summary of coho salmon tagging at Snettisham Hatchery, 1987 (D-J projects only).

Brood year	Tag code	Number tagged	Tagging dates	Release site
1985	4-27-27	20,975	3/17-18	Snettisham
1985	4-27-28	20,931	3/24-26	Salmon Creek
1985	4-27-29	21,191	3/26-28	Fish Creek
1985	4-27-30	20,595	3/28-29	Dredge Lake
1985	4-27-40	21,104	6/24-25	Snettisham

Transport

Chinook and coho salmon smolt transports took place from 22 May to 23 June. Groups of smolts transported in the 1.9-m³ tanks were loaded at densities of .05 to .21 kg/liter for the 6- to 14-h transports. The first chinook salmon transports to Fish Creek went reasonably well; 24-h mortalities were estimated at 0.5%, but the fish appeared stressed. On the second transport to Sheep and Auke Creeks, the 24-h mortalities at Auke Creek were 50% and 20%, while at Sheep Creek they were less than 0.3%. It appeared that the transport time, which exceeded 12 h, was a major factor in the mortality. When we investigated the transport stresses, we found that carbon-dioxide levels had built up in the tanks and reduced the ability of the fish to use oxygen. Aeration, however, can remove this carbon dioxide, so we installed aerators and used an antifoam compound on the remainder of the trips. Mortalities on later transports were again below 1% and considered insignificant.

The coho salmon released in Salmon Creek were transported in both the 1.9-m³ tanks and 121-liter plastic containers. Two transport methods were used because the holding area at this site was adequate for only a portion of the release; consequently, as a result, the fish were divided into only three release groups. The small containers were hauled in a float plane, and the larger container was used when its transport could be combined with another group of fish going to town.

Imprinting and Release

Success of the actual imprinting and efficacy of techniques will not be known until adult fish return from the releases. However, in all cases when fish were held captive for a period of time, they did well and were actively feeding prior to their release. Fish held at release sites had an average growth rate of 2.2%/day. For comparison, we expect about 1% growth/day at

Snettisham during this time period. Smolts liberated with no rearing at the release site adapted well to the new environment and presumably behaved as natural fish in terms of migration and rearing; however, at Fish Creek, these fish, which were released when the other fish had been placed into the net pen, stayed in the area. We observed them around the net pen where they fed on spilled food that had been directed at the net-pen fish.

To the extent possible, other releases within a species were made under the cover of darkness on the same day. The most notable exceptions were a group of chinook salmon that had been released at Snettisham 7 days after the town releases. The Fish Creek fish were released about a week later than those at Snettisham to provide for more growth and because the Salmon Creek site lacked the facilities for imprinting; these smolts were released on three separate occasions.

The transport losses at Auke Creek were replaced by planting additional fish in the direct release. By doing so we were able to achieve a total release that exceeded 90,000 fish (90,532). There will be some loss in the precision of marine-survival estimates of the reared fish because of the tagged fish that died during transport. Release dates, times, numbers, tag codes, and smolt sizes for chinook and coho salmon are presented in Tables 3 and 4, respectively.

Twin Lakes Coho Salmon Stocking

The objective was met when 10,000 coho salmon (1984 brood) were planted in the south end of Twin Lakes. The fish were expected to rapidly disperse and were observed at the far end several weeks later. The mean size of the stocked fish was 41.8 g. Additional fish from the 1984 and 1985 brood are being retained for stocking in 1988. Angler effort and success at Twin Lakes was not quantified during this report period.

Table 3. Summary of chinook salmon smolt releases in the Juneau area and related Snettisham Hatchery releases, 1987.

Release site	Treatment ¹ (days reared)	Tag code	Total no. released	Number tagged	Released Date	Time	% tag retention	Size g	mm
Auke Creek	Tidal (16)	4-27-50	15,038	15,038	7 June	2100	98.5	10.36	94.22
Auke Creek	Freshwater (16)	4-27-46	24,972	24,972	7 June	2100	72.1	10.06	92.86
Auke Creek	Direct	4-27-43	50,522	30,909	7 June	2300	84.0	9.05	88.74
Fish Creek	Tidal (23)	4-27-44	31,205	31,205	7 June	2100	91.3	10.97	95.93
Fish Creek	Direct	4-27-42	31,296	31,296	14 May	0100	81.9	7.61	84.17
Montana Crk	Freshwater (16)	4-27-48	31,112	31,112	7 June	2100	84.3	10.59	94.28
Sheep Creek	Direct	4-27-45	30,703	30,703	8 June	0100	93.0	8.39	89.03
Snettisham	Hatchery ²	4-27-47	31,422	31,422	14 June	1800	83.1	9.01	90.85
Snettisham	Hatchery ²	4-27-49	437,000	31,232	7 June	2300	87.4	7.90	89.98
Snettisham	Hatchery ²	4-22-26	278,000	38,840	7 June	2300	98.0	9.25	90.00

¹ The four general release treatments were (1) direct, a release directly from the transport container at the release site; (2) tidal, a release from a net pen provided with imprinting water primarily by tidal flow; (3) freshwater, a release from a net pen or raceway directly provided with the desired imprinting water; and (4) release from the hatchery directly into estuarine waters.

² Released into the hatchery's effluent at the smolt stage.

Table 4. Summary of coho salmon smolt releases in the Juneau area and related Snettisham Hatchery releases, 1987.

Release site	Treatment ¹ (days reared)	Tag code	Total no. released	Number tagged	Released		% tag retention	Size	
					Date	Time		g	mm
Dredge Lake	Direct	4-27-30	53,000	20,368	9 June	1000	92.2	3.41	66.90
Fish Creek	Tidal (20)	4-27-29	53,000	20,840	27 June	2100	96.4	7.75	85.16
Salmon Creek	Freshwater (3)	4-27-28	104,000	20,634	11-23 June	2200	95.9	3.46	67.07
Snettisham	Hatchery ²	4-27-27	518,000	20,755	19 June	2200	95.4	8.24	93.19
Snettisham (Montana Crk)	Hatchery ²	4-27-51	86,000	31,024	19 June	2200	88.4	6.17	81.14
Snettisham (King Salmon R)	Hatchery ²	4-27-52	44,000	30,835	19 June	2200	88.4	6.17	81.14

¹ The four general release treatments were (1) direct, a release directly from the transport container at the release site; (2) tidal, a release from a net pen provided with imprinting water primarily by tidal flow; (3) freshwater, a release from a net pen or raceway directly provided with the desired imprinting water; and (4) release from the hatchery directly into estuarine waters.

² Released into the hatchery's effluent at the smolt stage.

Early Stock Coho Salmon

There were no eggs collected from the early coho salmon stocks identified previously. At Montana Creek and King Salmon River, escapements were extremely low. The minimal escapement goal of 150 fish was not met for Montana Creek. At King Salmon River so few fish were seen that an egg take was not practical. A crew of three spent 7 days working with gill nets, electroshockers, and a weir to collect one female, which was released. The objective of releasing 130,000 coho salmon smolts from the 1985 egg takes at Montana Creek and King Salmon River was met with 86,000 and 44,000 smolts, respectively (see Table 4).

Steelhead Trout

The release objective of 2,400 steelhead trout was almost achieved when 2,253 steelhead trout were stocked in Montana Creek on 20 May 1987. The fish had been coded-wire tagged during the previous fall (tag code 4-25-51); tag retention was 100%. The average size of these fish was 41.4 g. There were no mortalities involved in the transport. The fish were transported in the 0.75-m³ plastic tote supplied with oxygen. They were released in a pool 10 km from salt water. After release the fish immediately dispersed in the creek and did not appear to be unusually stressed.

Egg takes were attempted on 6, 11, 15, and 26 May. An estimated 11,700 eggs were collected on two of these days. On the other days, none of the females collected were in spawning condition. We fell short of the objective of 30,000 eggs because there were few fish in the creek and most of the females had already spawned. Apparently, the fish spawned very soon, if not immediately, after entering the creek, possibly because of low-water levels. Survivals to the eyed stage of the eggs collected was 98%; however, there has since been an outbreak of costia in this group of alevins, and mortalities are estimated at 20%.

DISCUSSION

The number of chinook salmon smolts released in 1987 was adequate to meet our future sportfishing objectives. They will also enable us to compare production from four sites; however, because of the mortalities associated with the transport to Auke Creek pen sites, our precision in comparing imprinting strategies is lessened. The degree of loss will not be known until the adult return is evaluated. Assuming that our survival- and harvest-rate estimates are correct, the number of coho salmon smolts released in Juneau were also adequate in providing the planned additional sport harvest. However, because of the relatively small size of smolts, our estimate of 5% survival may be overly optimistic. This problem concerns us, and we have held back a number of coho salmon for additional rearing; these fish could be used for Juneau area stocking in 1988. In addition, it is my recommendation that we modify our smolt-release program to provide more rearing at the release sites.

We expect to be able to easily provide rearing at the release sites at Auke and Fish Creeks and, possibly, at Sheep Creek; however, at Montana Creek, Salmon Creek, and Dredge Lake, rearing facilities are not presently available. Options are being explored including an imprinting pond at Montana Creek and a net pen at Dredge Lake. At Salmon Creek there are no readily available rearing facilities other than Twin Lakes, and it was ruled out because of disease concerns. For the present it is our intention to maximize survival of releases at this site by providing the biggest smolts available. It is important that we continue to emphasize the Juneau area smolt releases in order to improve sport fishing.

The Twin Lakes 3-year-old coho salmon released in 1987 met our objective and are expected to provide a freshwater sport fishery. It is common to see people fishing along the shores of this

system. While they can't expect a fish as large as one in salt water, the lack of other alternatives for freshwater lake fishing accessible in Juneau makes this site especially attractive.

The early stock coho salmon program met the release objectives for 1987; however, the egg-take objectives were not met. As was explained earlier, this was due to extremely low escapements in the selected systems. We are now in the process of selecting other stocks of fish for this project. The Sport Fish Division feels that the Montana Creek stock will not meet the desired harvest window in the marine sport fishery. This same concern applies to the King Salmon River stock. At the present time I am working with the Sport Fish Division to identify alternative stocks.

The number of steelhead trout smolts released in Montana Creek was slightly less than the objective, but they were in excellent condition. An additional 24,000 steelhead trout smolts from Klawock Hatchery were planted in this creek in 1987. The combined production from these releases should provide a good fishery as well as an opportunity to evaluate the success of this stocking project in 1989 and 1990. While we have been moderately successful at obtaining steelhead trout eggs from Peterson Creek for Snettisham Hatchery, this species requires 3 years of culturing before reaching smolt size. Steelhead trout are also very susceptible to gas-bubble disease, and the hatchery occasionally has had to deal with supersaturation; the 1985 brood has bacterial kidney disease. Steelhead trout, therefore, are a difficult species to culture at Snettisham.

The Juneau Recreational Fisheries Project has been progressing in a manner consistent with the project plan and objectives. There will not be a significant number of returning adults harvested by sport fishermen until 1988 and 1989. Future reports will cover these returns and the degree to which the objectives were realized.

RECOMMENDATIONS

1. Continue the planting of chinook and coho salmon smolts in the Juneau area to enhance local sport fisheries in the marine and terminal freshwater areas.
2. Concentrate efforts on the rearing phase to provide maximal growth at rearing sites. This can be achieved by transferring fish at the earliest date and holding them as long as possible.
3. Continue the stocking of Twin Lakes with coho salmon to provide recreational fishing opportunities in that freshwater system.
4. Continue the testing of alternative coho salmon brood stocks to find one that offers increased opportunities for recreational fisheries, particularly in July and August.
5. Continue the steelhead trout enhancement project, with the emphasis on providing road-side angling opportunities. However, important discussion and planning regarding available hatchery rearing space, hatchery water temperatures, logistics, genetic concerns, and general feasibility must be accomplished before this program is intensified.

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APPENDIX

Appendix Table 1. Montana Creek (111-50-052) coho salmon brood-stock removal schedule^{a/}.

If total escapement enumeration is:	Left in stream: ^{b/}	Removed for hatchery: ^{c/}
Less than 150	150	None ^{d/}
More than 150 + 88	150 + (60% over 150)	(40% over 150)
More than 238 + 88	230 - (50% over 238)	35 + (50% over 238)
More than 326 + 88	247 + (40% over 326)	79 + (60% over 326)
More than 414 + 88	282 + (30% over 414) ^{e/}	132 + (70% over 414)

a/ Minimal escapement goal (MEG) = 150 and desired escapement goal (DEG) = 500.

b/ No less than 50% of the stream allocation shall be female.

c/ No more than half of which may be female, and the total shall not exceed the hatchery's specified egg-take goal. All pre-egg-take mortalities count as part of the hatchery allocation.

d/ Some of the next segment's hatchery allocation may be taken, however, if the area biologist is reasonably certain the MEG will be achieved.

e/ If and when the stream achieves its DEG, then a 90% removal rate is allowed (10% for stream).

Appendix Table 2. King Salmon River (111-17-10) coho salmon egg removal schedule.

Escapement ^{a/}	Hatchery may take
Fall survey counts	25% of the counted escapement No more than 60 females may be used for egg take purposes.

^{a/} Adult fish